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United States Department of Agriculture,

BUREAU OF PLANT INDUSTRY,

Farmers' Cooperative Demonstration Work,

WASHINGTON, D. C.

SELECTION OF COTTON AND CORN SEED ON SOUTHERN FARMS.¹

REASONS FOR SEED SELECTION.

In the production of better farm crops the use of good seed is of the greatest importance. The quality of the seed and the quantity and value of the crop are closely related. Within a seed is the minute germ that has all the characteristics of the preceding generations of that species with the modifications which the previous culture, soil, climate, and selection have given it, and these it transmits to the future plants.

While types in seed are persistent along general lines, variations constantly occur. In a field planted with the most carefully bred seed some plants will always appear which differ in some particulars from the general type. It is by selection and breeding from desirable variations occurring in this way that new varieties and improved strains of seed are frequently established. In cotton the size of the boll, the length and quality of lint, the time of maturity, the tendency to abundant fruitage, the height and form of stalks, and other plant characteristics may all be modified by selection and breeding with such ends in view. To maintain the purity and uniformity of the original variety, such variations must be discarded. If this is not done, however carefully the farmer may protect his seed from mixing at the gin, his field will each year show greater diversity of types until in the course of a few years the cotton produced will not be of any recognized variety. The seed has "run out", as it is commonly expressed, and is undesirable for planting purposes.

Seed selection is, then, necessary either to originate new varieties or strains of seed or to keep an established variety pure and of high excellence. To originate new varieties is work for the seed breeder rather than the general farmer. But every farmer should plant only high-grade seed of the variety best suited to his soil and climatic conditions, and keep it pure and productive by careful, intelligent selection. By high-grade or pure-bred seed is meant seed that will pro-

¹ This circular was originally prepared by the late Dr. S. A. Knapp, and is now revised and partially rewritten by J. A. Evans, of the Office of Farmers' Cooperative Demonstration Work. Helpful suggestions by W. B. Mercier, of the same office, and Dr. O. F. Cook, Bionomist in Charge of Cotton Breeding, are included.

duce uniform plants alike in appearance, habit of growth, maturity, productiveness, and quality of fruit. For the amount of labor involved no work upon the farm pays better than seed selection.

IMPROVEMENT OF COTTON BY SEED SELECTION.

Careless farming and gin-run seed are responsible for a lot of short cotton crops. There is but little pure-bred seed planted and the product of that little generally becomes more or less mixed in the field and at the gin.

Four points in the improvement of cotton seed should be given careful attention:¹ Variety or type, selection, ginning, and storing. By type is meant the kind of stalks, bolls, lint, and general characteristics.

CHOOSING THE VARIETY.

A farmer should determine the variety or type best suited to his conditions and should grow it exclusively and improve it by selection. In choosing a variety of cotton too little attention is usually given to some qualities of the variety and too much to others. Adaptability, productiveness, earliness, habit of growth, length and strength of fiber, and size of seed should all be considered in making a choice. A desirable type of Upland cotton is one having a strong, vigorous, short-jointed stalk with plenty of fruit limbs on the lower half, fruit limbs short jointed but extending to the outer border of the plant and fruiting to the end; large bolls, storm resisting; a good percentage of lint; medium-size seed; staple at least $1\frac{1}{8}$ inches and strong; plant hardy, early, and prolific.

Soil and climatic conditions must be considered. A variety suitable for growth on uplands or in dry sections may not prove entirely satisfactory on alluvial soil or under conditions of heavy rainfall.

The quality of the staple should be given special consideration. Many varieties of cotton now in common use, while possessing such desirable features as earliness and productiveness, yield a short, weak staple. Such varieties should be improved in this respect or discarded. Earliness and productiveness can be secured with other varieties producing a good strong staple. The general use of types of cotton producing a weak staple of less than an inch in length tends to lower the value of all Upland cotton and will ultimately result in great loss to the American growers.

THE SEED PATCH.

It will be found much easier to produce and maintain good seed if a separate seed or breeding plat is used. Set aside a few acres for this purpose. It should be located, if possible, some distance from the general crop, planted with the best obtainable seed of the variety intended to be grown, and prepared and cultivated in the best way.

¹ See Farmers' Bulletin 314, entitled "A Method of Breeding Early Cotton to Escape Boll-Weevil Damage," which will be sent without cost upon application to the Secretary of Agriculture.

Demonstration plats may be advantageously used as seed plats. With proper care every demonstration farm might become a good seed center for the community.

SELECTION OF PLANTS AND SEED.

The process of selection should be begun during the growing season by removing from the plat any plant which distinctly varies from the type of the chosen variety. The undesirable plants may be judged from external characteristics, such as the character of leaves, stalk, bloom, and bolls.¹ This is the method used by growers of high-grade garden seed and is called "roguing." If sufficiently familiar with the habit of growth and general appearance of his variety, the farmer should be able to detect and remove the "rogues" from his seed plats before they have reached full blooming period, thus avoiding the possibility of cross pollination. The number of undesirable plants to be removed will depend upon the purity of the seed planted.

The final selection is made in the fall after the cotton is matured. If the foregoing instructions have been observed the plants in the seed plat are now all of the same type and the seed may be used in the general crop, but some plants are more vigorous and prolific than others. Seed from only the very best plants should be saved for the next year's seed plat.

After a careful inspection of the plat and examination of the individual plants, selection of these is made. The choice is based on trueness to type, vigor, productiveness, earliness, and length, strength, and quantity of the lint of each plant. This final selection should be made before picking begins and the stalks marked in some way so they may be distinguished. Pick separately from the balance of the plat, rejecting imperfect or injured bolls and those on the tips of limbs and top of the stalk and those too near the ground. The top and end bolls are liable to be opened prematurely and seed in the bolls near the ground may be injured by moisture. In making a selection never take a plant except one that is true to the variety type and just what you want your crop to be next year. You can not buy such seed. *Raise it.*

GINNING AND CLEANING.

Store your selected seed in a dry place and wait until the steam gins are nearly through; then carefully clean the gin, put down a sheet to catch the seed, and run your selected lot through. Store in a dry place till it is time for planting.

Before planting, run this seed through a fanning mill,² blowing out any seeds that may be light and screening out any that are too small. Follow this method just as closely as possible.

¹ See Circular 66, Bureau of Plant Industry, "Cotton Selection on the Farm by the Characters of the Stalks, Leaves, and Bolls."

² See Farmers' Bulletin 285, entitled "The Advantage of Planting Heavy Cotton Seed," which will be sent without cost upon application to the Secretary of Agriculture.

COMMUNITY SEED GROWING.

There should be one or more careful, conscientious cotton-seed growers in each community. Such a farmer would soon find a demand for his seed from his neighbors, and the whole community would profit by his care and skill.

For many reasons it would appear to be highly advantageous for all the farmers in one community to plant the same variety of cotton, bred in the community and kept up to a high standard of excellence by careful selection. This would to a great extent avoid the trouble arising from the mixing of seed at the gins and would insure a higher average yield and a more uniform product. Communities or whole counties in this way could establish a reputation for their cotton and would bring buyers direct from manufacturers and insure a premium on their cotton.

IMPROVEMENT OF CORN BY SEED SELECTION.

Corn is one of the easiest plants to modify with which the farmer has to deal, and there is no plant that will respond more quickly to intelligent efforts at improvement. Corn is also very susceptible to the effect of a change of climatic or soil conditions; hence, it is very difficult to predict that the best variety at one place will prove to be the best in another locality. Owing to these facts we are liable to many disappointments in purchasing new varieties of corn, and this emphasizes the importance of at least one farmer in each community making it a business to select his seed corn with a view to obtaining the best variety for his section. In fact, this improvement of corn by selection is so simple that there is no reason why each farmer should not give it his attention. Unless this is done, seed will soon deteriorate and it will be necessary to purchase improved seed corn if it is desired to obtain the best results. (See fig. 1.) Farmers' Bulletin No. 229, entitled "The Production of Good Seed Corn," is a treatise on the selection and care of seed corn which should be in the hands of every farmer.

FIELD SELECTION OF SEED CORN.

The following is a brief outline of just how to select seed corn:

The corn it is desired to improve should be planted on a separate well-prepared plat and well cultivated. When the plants have silked, go through the field and remove all plants that have not started an ear. After this and before harvesting, go through the plat carefully and select the best stalks, marking them so they can be readily distinguished.

An ideal stalk is one without suckers, thick at base, with well-developed roots, as shown by its vigorous growth, and bearing a good

ear or ears about 4 feet from the ground. The stalk when mature should be not more than 8 or 10 feet high.

If it is desired to produce an early variety, only those stalks that mature first should be marked.

Select stalks that are free from smut or disease and are not in the immediate neighborhood of other diseased stalks. If a prolific variety, the stalk should have at least two good ears upon shanks 4 or 5 inches long, and these ears should show a decided tendency to



FIG. 1.—Illustration of the yield of corn per acre, allowing a single ear for each hill, the hills being $3\frac{1}{2}$ feet apart: A, 29 bushels; B, 30 bushels; C, 40 bushels; D, 45 bushels; E, 50 bushels. (From Farmers' Bulletin No. 253.)

turn down. The accompanying cut (fig. 2) shows a desirable and an undesirable stalk.

GATHERING AND STORING THE SEED EARS.

As soon as the corn is sufficiently dry it should be carefully gathered and housed. In gathering for seed, gather only from the selected stalks. If there are two good ears on a stalk, take both. If one is poor, select only the good one. Gather for seed only those ears that have the end well covered with a close-fitting shuck, as this is a very effective protection against the weevil. Except as stated, not much can be done in selecting the ear at this time. Store the ears in a cool, dry, well-ventilated place and not in too great a bulk, so there will be no danger of heating. Seed corn should also be kept from freezing.¹

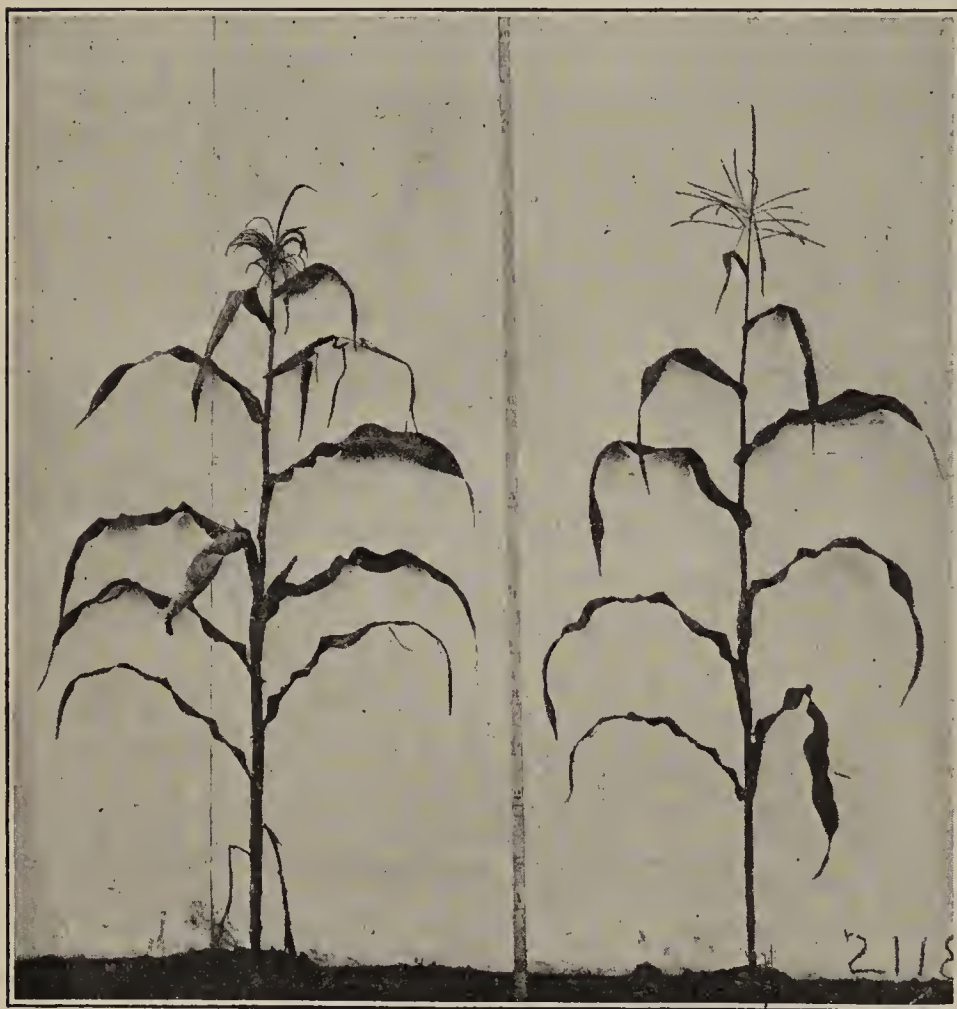
When the opportunity presents itself during the winter, this seed corn should be carefully shucked and the best ears selected.

¹ See Farmers' Bulletin 313, entitled "Harvesting and Storing Corn," which will be sent without cost upon application to the Secretary of Agriculture.

THE IDEAL EAR.

An ideal ear of corn is nearly cylindrical in shape, tapering only slightly from the butt to the tip. The rows of corn should be straight and compact, commencing close to the shank and with good depth of grain almost the entire length of the ear. The cob should be of medium size, about one-half the diameter of the ear at a distance of one-third of its length from the base, and the length of the ear should be about four times its diameter. Extra large or extra long ears should be avoided as much as small ears.

The accompanying cuts (figs. 3 and 4) show the characteristic



qualities of a desirable and an undesirable ear.

The grains of the ear should be of uniform size and should fit snugly. They should be fairly long, nearly flat on the sides, and slightly tapering on both edges. The dent should be only slight and the outer ends should be well filled out and not chaffy.

THE SEED PATCH.

FIG. 2.—A productive and a barren stalk of corn. (From Farmers' Bulletin No. 229.)

When ready to plant, select from this lot of corn as many ears as are necessary for the seed patch, of as nearly uniform color, shape, and size as possible. Remove the imperfect and irregular grains at tip and butt and plant the remainder in carefully prepared ground. Have the seed patch as far removed from other cornfields as possible, so as to avoid mixing. Give this patch special care and cultivation, and practice the same care in selection each year. The patch should not be too large; a few acres is ample for the average farm. After making final selection for the seed patch, the remainder of the selected corn can be used for the main crop. By keeping up this practice of selection from year to year a wonderful improvement can be made in the yield and quality of corn.

It has been demonstrated that, all other conditions being equal, an average increase in the yield over common corn of from 3 to 5 bushels per acre can easily be made the first year. As the whole crop is improved, of course this rate of increase will not be so rapid, but if persisted in from year to year the careful selection of seed will have an ultimate marked effect upon the corn yield.

HOW THE FARMER MAY PROFIT BY SEED SELECTION.

The farmer who follows this practice of seed selection persistently will not only be repaid by the increased yield of his corn, but he will soon find that he can command quite a premium for it from his less progressive neighbors by selling it to them for seed at a price much greater than ordinary seed corn commands. The satisfaction of know-

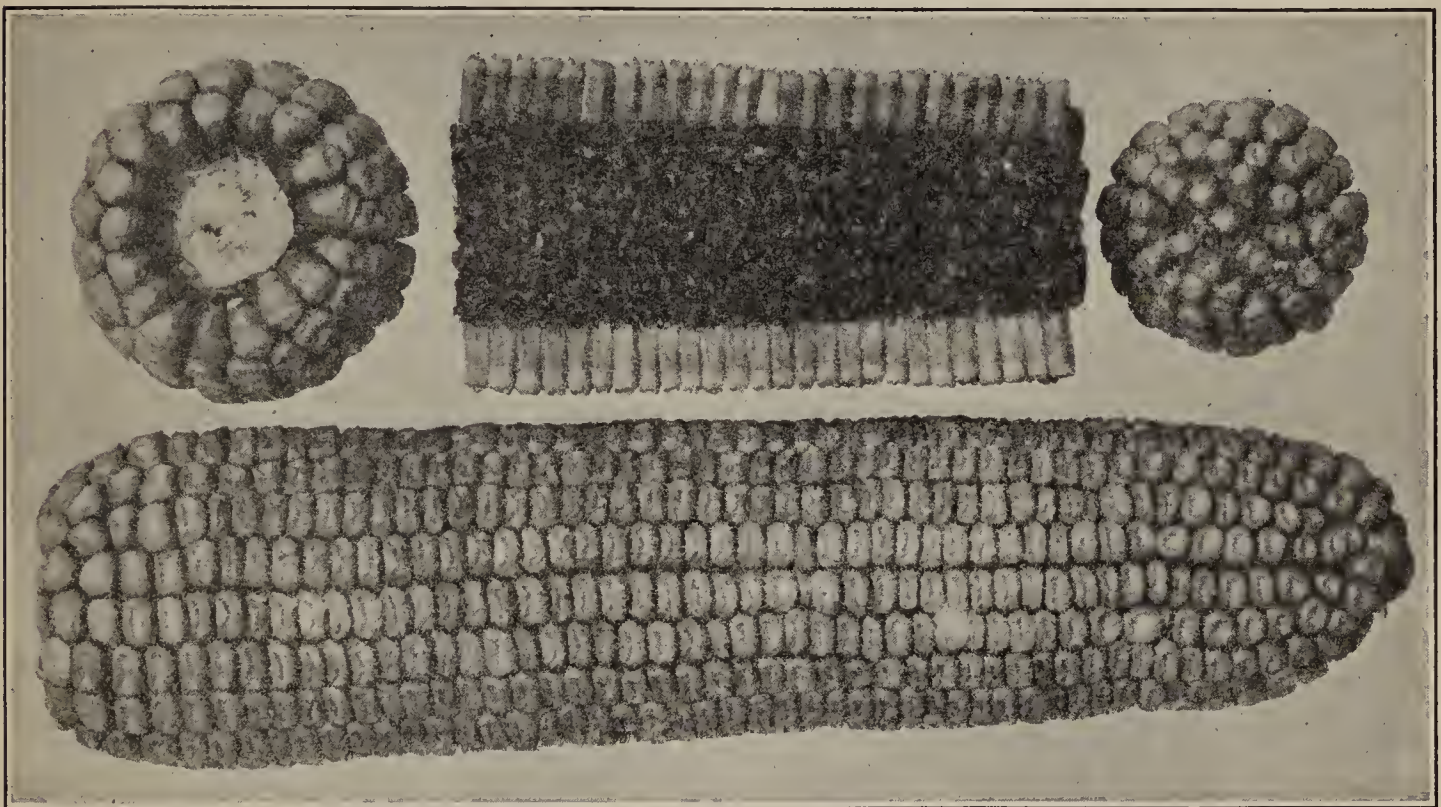


FIG. 3.—Two ears of corn which possess excellent visible characters. (From Farmers' Bulletin No. 229.)

ing that he has a better corn for his conditions than can be purchased at any price will be an additional compensation.

The South is in greater need of improved varieties of corn than is the case with any of its other crops. Cotton has received fairly good attention, but the corn crop has been sadly neglected. Our people are beginning to realize its importance, and quite a remunerative field of industry awaits the farmer who will make a business of raising reliable seed corn. Owing to the fact that corn is so easily influenced by a change of climate and soil, the field for this industry is very broad and is not likely to become crowded.

GERMINATION TEST FOR SEED CORN.

A great amount of trouble in securing stands from all purchased seed, and especially that of corn, is due to the fact that much seed so obtained is of low vitality. When it is necessary to purchase seed corn, the seller should always be required to guarantee a germination

of 100 per cent. Always buy seed corn upon the ear; then you can form some idea of what is being purchased. Afterwards test its germinative powers as follows:¹

Have an ordinary box about 12 inches wide, 18 inches long, and 12 inches deep. Put into the bottom 8 inches of horse dung, wetting it well and packing it into the box. On top of this place 2 inches of well-dampened sandy soil and fit a piece of muslin or thin cloth into the box on top of this. The muslin should previously have been marked into 1-inch squares with a pencil or ink, these squares being numbered. Now number the ears to be tested to correspond with the squares. Take six grains of corn from each ear, two near the butt, two at the

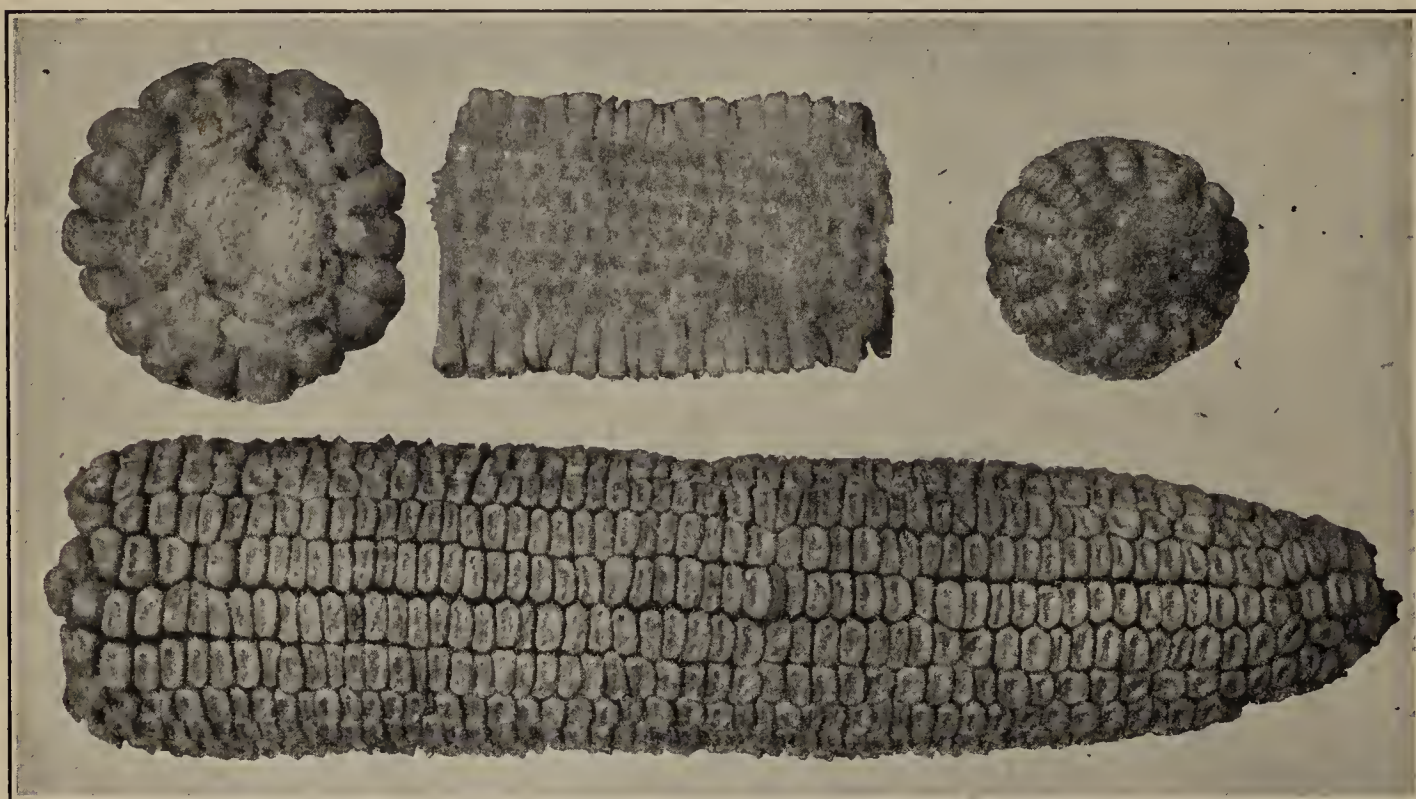


FIG. 4.—Two undesirable ears of corn. (From Farmers' Bulletin No. 229.)

middle, and two near the tip, taking each grain from a different row. Place each set of grains on the square of muslin corresponding to the number of the ear. When all the squares, or as many as you have ears to be tested, are occupied, cover them with several thicknesses of a damp, heavy cloth and set the whole in a warm place.

In about seven or eight days, or even in a shorter time if the weather is warm, examine the grains and take for seed only those ears from which all the grains have germinated. This precaution will avoid much disappointment in securing stands.

BRADFORD KNAPP,
Special Agent in Charge.

Approved:

W. A. TAYLOR,
Chief of Bureau.

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¹ See Farmers' Bulletins 81, 229, 414, and 415, which will be sent without cost upon application to the Secretary of Agriculture.